



PATENT  
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

WOLFGANG BILLINGER, et al.

Group Art Unit: 3644

Serial No. 10/053,666

Examiner: S. Holzen

Filed: January 24, 2002

For: DEVICE FOR CONNECTING MOVABLE PARTS WITH STRUCTURAL  
ELEMENTS OF AIRPLANES AND THE LIKE

*DECLARATION OF HELMUT KAUFMANN*

Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, Helmut Kaufmann, do hereby declare the following:

1. I am currently employed by the ARC

Leichtmetallkompetenzzentrum Ranshofen GmbH (hereafter "LKR"), an R&D company in Austria focused on light metal technology. LKR projects range from alloying to component design, mainly with respect to aluminum and magnesium alloys. However, in the case of design and stress engineering, parts made out of steel, titanium, polymers or ceramics may be treated as well.

2. I received my M.S. in mechanical engineering and my Ph.D. in material science from the Montanuniversität Leoben (Austria) in 1987 and 1992, respectively. After serving for one year as a visiting scientist at the Materials Science Department of the Massachusetts Institute of Technology (MIT) in the United States in

1989, I joined Austria Metall AG (AMAG) where I conducted research work in casting technology. In 1994, I moved to Ube Europe GmbH in Düsseldorf (Germany) where my work focussed on Squeeze Casting and Semi-Solid Casting. Upon returning to Austria in 1997, I took the position of head of the Light Metal Competence Center of LKR in Ranshofen. In 2000, when LKR became a wholly owned subsidiary company of the Austrian Research Centers GmbH, I was appointed Managing Director of LKR.

3. As a result of my education and experience, it is my opinion that persons of ordinary skill in the aviation field as related to composite technology would have at least a bachelor's degree in mechanical engineering, and would have at least several years of experience in mechanical engineering.

4. Drawing upon my expertise in this industry and my understanding of the level of ordinary skill in the art at the time the above-captioned application was filed (January 24, 2002), I can offer my expert opinion as to how persons of ordinary skill in the art perceived the use of composite technology as it pertains to the aviation field, and can also offer my expert opinion as to structures resulting from the resin transfer molding (RTM) process.

5. Prior to 2004 it was conventional to make aircraft spoiler hinges of aluminum or titanium alloys, mainly forgings. In addition, what was known by persons of ordinary skill was reliance upon metal fasteners, such as screws or rivets, for secure connection of the metal fittings to the movable parts.

6. In 2004, I became aware of the design for a carbon fiber reinforced plastic/resin transfer molding (CFRP/RTM) center hinge fitting, i.e., aircraft spoiler hinge, developed by Mr. Wolfgang Billinger at Fischer Advanced Composite Components AG. I have reviewed the corresponding subject matter of Mr. Billinger's captioned U.S. patent application, namely Serial No. 10/053,666 (hereinafter "the Billinger application"), which to my view sets forth the CFRP/RTM aircraft spoiler hinge according to his design.

7. I have also reviewed the prior art considered by the Patent Examiner, specifically U.S. Patent No. 6,234,423 to Hirahara et al. (hereinafter "Hirahara"), in connection with the Billinger application.

8. Hirahara shows a typical moveable surface of an aircraft, such as an elevator, where the spar 13, consisting of flanges 13a and a web 13b, is an integral part of the movable surface formed by stiffened skins 11 and 12. The spar 13 has six hinges attached, which I have marked with the letter "H" in the attached drawing from Hirahara, that are used to connect the spar to the aircraft structure. According to conventional wisdom and practice, to obtain sufficient structural strength these hinges are made from forged alloys of aluminum, high strength steel or titanium. To the best of my understanding upon review thereof, Hirahara does not address the hinges at all, but only methods of forming the box structure of the movable surface.

9. The spar 13, as constructed according to Hirahara, could

not be produced as a single piece composite part together with the fitting, constituted by the six hinges "H", using known state-of-the-art technology because of the significant differences in wall thicknesses between hinges (thicknesses larger than 0.5 inch, and most likely 1.0 inch) and the web and flanges of the movable part (thicknesses less than 0.2 inch, and most likely 0.1 inches), and the mechanical properties needed in order to acceptably replace a metal fitting made, for example, of forged aluminum alloy material or other higher properties material.

10. The technology according to the Billinger application is the only way to produce fittings having the required mechanical properties, i.e., properties equivalent to high end metallic alloys, using composite materials such as carbon-fiber reinforced materials, when the fittings will be used in parts which have significant wall thickness differentiation, as is the case with aircraft fittings and associated movable parts.

11. Resins used in fiber reinforced systems such as RTM are modified with additives in order to attain mechanical properties similar to those exhibited by forged versions made from alloys of aluminum, high strength steel or titanium. These additives generally modify the flow characteristics of the resin, changing their structure. Complicated geometries, like geometries having significant wall thickness differentiation, cannot be produced with conventional resin systems.

12. It is thus my opinion that a *fitting* made of synthetic

composite material according to the RTM method, whether joined to the movable part by gluing or formed integrally therewith, is structurally different from the structure and process disclosed by Hirahara and further is not obvious to one of ordinary skill in the art in view of the disclosure in Hirahara, especially since Hirahara does not speak to the fitting, i.e., the hinges, at all. Even if one were to make the hinges in Hirahara of the same composite material as that disclosed for the skins and spar 13, such theoretical hinges would lack sufficient structural strength for their intended use and would certainly lack the structural strength realized by the fittings made of synthetic composite material according to the RTM method as claimed by the Billinger application.

13. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

31. 7. 2007  
Date

H. Kaufmann  
Dr. Helmut Kaufmann